CONFIDENTIAL

file
Air-Fel
Incinerator

In replying please address:

25X1

March 6, 1961

Dear Sir:

In accord with a discussion with your technical representative on February 27, we are submitting herewith a proposed program of additional research directed toward the further development of the Model 2 incinerator, particularly with regard to the provision of a suitable emergency power source and the investigation of the effect of altitude on the burning capacity.

The Model 2 incinerator has been designed to be driven by a 2-hp electric motor, which could be connected to the normal electric service or, if necessary, to a source of standby electric power. However, your technical representative has determined that standby electric power will not be available at the various potential installations; and has requested that consideration be given to the development of a suitable emergency power unit incorporating a gasoline engine and a mechanical drive, and to the provision of an experimental unit of this kind as a part of each of the two experimental Model 2 lower sections (including motor-blower assemblies) which are currently being prepared.

Also, your technical representative is interested in an evaluation of the effect of altitude, at the incinerator site, on the burning rate obtainable in a Model 2 unit, as well as in a Model 1 unit. Thus far, the

44 056 22M 020780 56 10 2010 010956 01 C

ORIGINAL CL BY 235979
☐ DECL ☒ REVW ON 2010
EXT BYND 6 YRS BY SAME
REASON 3.2(3)

experimental and field trials of the Model 1 and Model 2 units have been carried out at altitudes generally below 1,000 ft, but the need for installing such units at altitudes up to about 8,000 ft is anticipated. At high altitudes, the air density is low, and the weight of the air flowing through any incinerator would decrease in proportion to the air density; the burning rate for any incinerator would decrease at least as much as the air flow, and perhaps more. Therefore, it would be highly desirable to determine experimentally the effect of altitude on burning rate, in order to provide a basis for estimating or predicting the burning capacities of the selected incinerators at high-altitude sites.

A proposed program of additional research, aimed at achieving the above-outlined goals, is described in the following.

Objectives

The objectives of the proposed program would be to conduct additional research directed toward the development and provision of an experimental, emergency, mechanical power source suitable for the Model 2 incinerator, and the investigation of the effect of altitude on the burning rate of the Model 1 and Model 2 incinerators.

Proposed General Method of Procedure

Emergency, Mechanical Power Source

An emergency, mechanical power source for this application might be based on either a gasoline engine or a diesel engine connected to the

blower-motor shaft by a mechanical drive. During your technical representative's visit on February 27, both gasoline and diesel engines were discussed, and the diesel-engine-drive arrangement was discarded from further consideration because of the high weight and cost of available appropriate diesel engines. Accordingly, under the proposed program, it is currently contemplated that a suitable commercial gasoline engine would be selected, considering performance, size, weight, durability, and cost; also, appropriate accessories for easily connecting the engine to the blower motor and for holding the engine in position would be chosen. To the extent possible, attempts would be made to select an engine which would operate appropriately over the range of altitudes of interest. A typical engine of the class under consideration is the Briggs and Stratton Model 143332, a 1-cylinder, 4-cycle engine which develops 4 hp at 2,700 rpm, weighs 45 lb, and costs about $75.

An experimental emergency power unit would be prepared, using the above-indicated selected items, for each of the two Model 2 lower sections now under development. Each of these units would be provided with a mounting base which would attach quickly to suitable fixtures to be provided on each incinerator lower section. A mechanical drive assembly, such as a V-belt drive or a flexible-shaft drive, would be included to permit the engine to drive the blower motor. To the extent possible, the experimental emergency power units would be compact and light in weight, so that they could be readily carried from a storage area near the incinerators, rapidly attached, and then put into service quickly, without a large number of critical adjustments.

Every effort would be made to minimize the effects of engine vibration on the incinerator operation. The incinerator would be isolated from

engine vibration to the extent possible; the design would be checked and modified so as to minimize the possibility that any of the internal nuts would come loose under the operating-engine vibration.

Also, it is anticipated that the engine exhaust would be vented into the fan inlet and passed out the incinerator stack.

Since the engine speed, and the resulting blower speed, can be varied at will, a means of adjustment to achieve the appropriate blower speed will be needed. It is contemplated that either an engine tachometer or a dial-type gage for use in reading the incinerator plenum pressure would be provided for this purpose.

After preparation of the two experimental emergency power units was concluded, each would be evaluated in the laboratory during an 8-hr cold-air-flow experiment and two 4-hr burning trials on the Model 2 incinerator. The operation of one or both of the experimental units would be demonstrated to your technical representative, and any mutually agreeable minor modifications stemming from such a demonstration would be incorporated in the experimental units to the extent possible within the limits of the time and funds provided.

If, as expected, the results of the proposed effort are favorable, it is expected that the experimental lower section with the motor-blower assembly equipped to operate on 208, 220, or 440-volt, 50 or 60 cycle, 3-phase current, and one of the experimental gasoline-engine standby-power assemblies described above, would be made available to your technical representative before the effort with regard to the second experimental lower section was concluded. Further, it is currently estimated that

the experimental top (combustion chamber) section and the 110-volt, 50 or 60-cycle, single-phase lower section with its experimental gasoline-engine standby-power assembly could be provided to your technical representative, for further evaluation, by approximately 1 to 2 months prior to the end of the extended research period proposed in our letter dated February 14, 1961, and also here.

Effect of Altitude on Incinerator Burning Rates

The most direct approach to the evaluation of the effect of altitude on the burning rates of the Model 1 and Model 2 incinerators would be to conduct burning-rate studies at a few selected altitudes under carefully controlled conditions, and then to correlate the results with those obtained previously in the course of the development of these incinerators; thus, a means of estimating or predicting burning rates at all altitudes of interest would be provided. An alternative approach, involving a much lower cost, would be to determine the effects of altitude by analytical means, and then to correlate the analytical results with operational results obtained for a unit installed at a high-altitude site.

Under the program of additional research described here, it is proposed that the effect of altitude on the Model 1 and Model 2 burning rates would be investigated by implementing the latter approach. Accordingly, a theoretical analysis would be performed on the influence of altitude on the weight flow of air through the two pertinent incinerator configurations. Further, the burning-rate data to be obtained in the very near future by your technical representative at a medium-high-altitude site would be

analyzed and evaluated. Also, the burning-rate data obtained in the course of the development of the Model 1 and Model 2 incinerators would be studied further. The information from these three analytical efforts would be integrated. As a result of this proposed activity, it is anticipated that a basis would be obtained for estimating or predicting the burning rates of the two incinerators of interest at altitudes up to a maximum of approximately 8,000 ft. This basis would also be useful in the selection of possibly necessary changes in the blower design, in order to provide for the desired performance of these two incinerators particularly at the higher altitudes of interest.

The variation of burning rate with altitude depends upon two factors: (1) the decrease in the weight of air flowing through the incinerator as the air density decreases; and (2) the possibility of a decrease in the amount of "fuel" (paper) burned by each pound of air passing through the unit, because of a decrease in the agitation of the "fuel" bed by the air jets. It is considered that the parameters which influence the weight flow of air through the incinerators are well understood. Thus, it is contemplated that curves and/or tables showing the variation of air flow with altitude would be prepared. These would include consideration of various combinations of stack resistance and incinerator-damper settings, and would show the effects of selected impeller sizes and speeds. If indeed the fuel/air ratio of the incinerators is not affected by altitude, then the computed variations in air weight flow rates would be proportional to the burning rates.

At the present time, we have no basis for evaluating the changes in the fuel/air ratio that may occur at different altitudes. One exact

measure of fuel/air ratio is incinerator-stack temperatures; precise, comprehensive data showing the variation of stack temperature with time during the burning of typical loads at a high altitude would provide key information for the prediction of burning rates at other altitudes. Thus, it is contemplated that the appropriate data to be obtained by your technical representative at a medium-high-altitude installation would be analyzed and used to determine the effects, if any, of altitude on the fuel/air ratio. In addition to a study of the effects of altitude when the system geometry is constant, the changes in fan design or selection that might be necessary in order to improve burning rates at high altitudes would also be investigated and included in the various proposed comparisons.

It is anticipated that the over-all results of this proposed altitude study would be compiled, for both incinerators, in the form of curves and/or tables showing burning rates as affected by altitude, and of recommendations of selected changes in blower design that may be needed in order to improve performance at the higher altitudes.

However, if, for some reason, your technical representative is unable to obtain and provide to us the appropriate medium-high-altitude burning-rate data, then other ways of securing the necessary information would have to be considered. These would be discussed with your technical representative, and after mutual agreement was reached, appropriate contractual arrangements, if necessary, would be initiated.

It is emphasized that every effort would be made to expedite the performance of the proposed additional research. Also, to the extent mutually

considered pertinent, the results obtained from the proposed additional effort would be reflected in the Model 2 working drawings which are currently under preparation.

Reports and Liaison

Monthly letter reports would be submitted to keep your technical representatives informed of the progress of the proposed program. These would be supplemented by meetings and telephone discussions with your technical representatives. At the conclusion of the proposed research period, a summary report describing the results of the research performed would be submitted.

Duration and Costs

It is proposed that the contract provide for an additional one-month period of research, with an increase in the estimated appropriation of $6,890, including an increase in the fixed fee of $390. A general breakdown of the increase in the estimated costs is attached.

The Contract

The proposed amendment to the contract would be a period-basis research agreement, consistent with our current contractual arrangements and providing only for a fixed period of research leading toward the objectives outlined above.

If you should have any questions with regard to this proposal, please do not hesitate to call us. Any inquiries of a contractual nature

 March 6, 1961

may be directed to [redacted] at Extension 159. We would appreciate your expeditious consideration of this proposed additional research. 25X1

Very truly yours,

[redacted] 25X1

EES:sjm

In Duplicate